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(54) Title of the invention Ink cartridge in printers

(57) Abstract (amended)

# **Problem to be solved**

To provide an ink cartridge filled with various amount of ink corresponding to its use purpose.

# **Solution**

On an ink cartridge 1 engaging projections 12 are provided, a housing space for the ink cartridge is provided to an adapter 100, a casing 110 has fitting parts 116 to be engaged with the engaging projections 12, and a lock frame member 130 to fix the casing and the ink cartridge loaded in the housing space are made fixable to the casing 110.

Engaging holes 117 and pawls are provided to the side walls of the casing 110 to enable to engage with the inward projections 143 of lock levers 142 and the stop pawls 154 of slip-off preventing levers 153, and the casing 110 is altered in its appearance shape so as to be adapted to the shape of the ink cartridge 1 and the mounting region in a printer. Further, the casings 110 can be arranged adjacently to enable loading of the ink cartridges 1 filled with different color inks to the casings 110. Moreover the height of a bottom part is altered or stuffing such as an air bag is inserted to nable to alter and adjust the ink capacity of a foam chamber.

## Claims

**Claim 1** An ink cartridge used in printers, whose external shape is altered according to amount of ink inserted therein and wherein the ink cartridge can be attached and detached freely in an adapter which can be loaded in printers.

**Claim 2** An ink cartridge according to claim 1, wherein engaging projections are projected on said ink cartridge, an adapter is composed of a casing, which has a housing space for loading the ink cartridge and fitting parts engaged with said engaging projections, and of a lock frame member which is fixedly connected to said casing to fix said casing and said ink cartridge loaded in said housing space.

**Claim 3** An ink cartridge according to claim 2, wherein engaging holes and pawl holes provided on side walls of said casing can be engaged with inward projections of lock levers provided on a lock frame member and stop pawls of slip-off preventing levers respectively.

**Claim 4** An ink cartridge according to claim 2 or 3, wherein a casing of said adapter is altered in its appearance configuration to be adjusted to shape of an ink cartridge and mounting region in printers.

**Claim 5** An ink cartridge according to claim 2 or 3, wherein ink cartridges filled with different color inks can be loaded to each casing by arranging casings of said adapters adjacently.

**Claim 6** An ink cartridge according to claim 1, wherein projections are provided on said ink cartridge, a housing space for the ink cartridge and insertion slits engaged with said engaging projections are provided to an adapter to which an ink cartridge can be loaded, and movable levers enable the ink cartridge loaded in the housing space fixable.

**Claim 7** An ink cartridge loadable to printers, whose ink amount inserted therein is adjustable without changing its external shape.

**Claim 8** An ink cartridge according to claim 7, wherein ink capacity of a form chamber is alterable and adjustable by changing the height of the bottom part of said ink cartridge.

**Claim 9** An ink cartridge according to claim 7, wherein ink capacity of a form chamber is alterable and adjustable by stuffing an air bag into the form chamber.

## Detailed description of the invention

[0001]

**Technical field of the invention**

This invention belongs to the technical field of ink cartridges which supply ink to printers, such as an ink jet printer.

[0002]

**Prior art**

Conventionally, especially when a personal use was presented on printers, such as an ink jet printer which prints season greetings and various kinds of notices, such as a New Year's card and a greeting card, the fault that sudden ink lack and superfluous ink remains occur was pointed out.

[0003] It is thought that the reason is in lack of consideration to supply only a required quantity of ink to a printer neither more nor less, since ink cartridges were mostly uniformly filled with ink and loaded in a printer and presented for printing.

[0004] Instead, a conventional ink cartridge which can be loaded in a predetermined printer was filled with ink, and it was regarded in the industry as an important matter to prevent ink shortage beforehand and to provide a way to refill ink cartridges with ink depending on the needs.

[0005]

**Problems to be resolved by the invention**

In conventional ink supply method as mentioned above, for focusing on preventing ink shortage, an ink cartridge is intended filled with sufficient amount of ink. However the measure in case that an ink cartridge having excessive ink inside is loaded on a printer for a long time without being used has been wanted.

[0006]

The 1st problem to be solved by the present invention is offering an ink cartridge filled with proper amount of ink depending on use purpose, which can be loaded easily in a printer to be used for printing.

[0007] The 2nd problem to be solved by the present invention is offering an ink cartridge which can be loaded in printers stably by using an adapter having configuration suitable for the mounting region of printers.

[0008] The 3rd problem to be solved by the present invention is offering an ink cartridge which is applicable to color printers.

[0009] The 4th problem to be solved by the present invention is offering an ink cartridge

having a certain appearance configuration and on the other hand having freely variable ink capacity.

[0010] The 5th problem to be solved by the present invention is offering an ink cartridge whose ink supply amount is easy to be adjusted.

[0011]

**Means for solving the problems**

The means provided by the present invention to solve the said problems are as follows.

[0012] (1) An ink cartridge used in printers, whose external shape is altered according to amount of ink inserted therein and wherein the ink cartridge can be attached and detached freely in an adapter which can be loaded in printers.

[0013] (2) An ink cartridge according to (1), wherein engaging projections are projected on said ink cartridge, an adapter is composed of a casing, which has a housing space for loading the ink cartridge and fitting parts to be engaged with said engaging projections, and of a lock member which is fixedly connected to said casing to fix said casing and said ink cartridge loaded in said housing space.

[0014] (3) An ink cartridge according to (2), wherein engaging holes and pawl holes provided on side walls of said casing can be engaged with inward projections of lock levers provided on a lock frame member and stop pawls of slip-off preventing levers respectively.

[0015] (4) An ink cartridge according to (2) or (3), wherein a casing of said adapter is altered in its appearance configuration to be adjusted to shape of the ink cartridge and mounting region in printers.

[0016] (5) An ink cartridge according to (2) or (3), wherein ink cartridges filled with different color inks can be loaded to each casing by arranging casings of said adapters adjacently.

[0017] (6) An ink cartridge according to (1), wherein projections are provided on said ink cartridge, a housing space for the ink cartridge and insertion slots engaged with said engaging projections are provided to an adapter to which the ink cartridge can be loaded, and movable levers enable the ink cartridge loaded in the housing space fixable.

[0018] (7) An ink cartridge which can be loaded to printers, whose ink amount inserted therein is adjustable without changing its external shape.

[0019] (8) An ink cartridge according to (7), wherein ink capacity of a form chamber is alterable and adjustable by changing the height of the bottom part of said ink cartridge.

[0020] (9) An ink cartridge according to (7), wherein ink capacity of form chamber is

alterable and adjustable by stuffing an air bag into the form chamber.

[0021]

### **Embodiments**

Hereafter, each of the illustrated embodiments is explained.

[0022] (Embodiment 1) An ink cartridge according to Embodiment 1 is a type of cartridge which is loaded to printers by being attached in an adapter.

[0023] 1. Structure

Structure of an ink cartridge 1 and its adapter 100 shown in the Fig.1 to Fig.4 is as follows.

[0024] (1) Ink cartridge 1

An ink cartridge has an abbreviation rectangular parallelepiped-like appearance configuration, wherein a form absorbed with ink is placed inside, and an ink supply port 11 at the bottom can lead the ink out and supply the ink to the head part (illustration omitted) in printers, and on the both side walls of the ink cartridge engaging projections 12 are projected to be engaged with an adapter 100 mentioned later.

[0025] (2) Adapter 100

An adapter 100 to which said ink cartridge 1 can be attached and detached freely is consisted of a casing 110 and an L shaped lock frame member 130.

[0026] In said casing 110, hold space 111 whose top is opened for inserting an ink cartridge 1 is provided, at the bottom part 112 an ink supply opening 113 is provided, on the both side walls 114 finger holes 115 shaped like laid bottles are provided, and a narrowed fitting parts 116 can be engaged with engaging projections 12 of said ink cartridge 1. (refer to the Fig. 2)

[0027] Moreover, at the top and bottom position of the both side walls 114 engaging holes 117 and pawl holes 118 are provided to be engaged and detached with a lock frame member 130 mentioned later, and crowning portion is concaved as engagement slits 119.

[0028] In addition, thick parts 120 and 121 to support an ink cartridge 1 are provided as inward projections on the internal surface of the both side walls 114.

[0029] And, a lock frame member 130 shaped like L is formed with a horizontal frame part 140 and a vertical part 150 in a united body, preferably formed as one using resin material which has flexibility to some extent.

[0030] Said horizontal frame part 140 has a holding down section 141 and lock levers 142 in parallel, and to the outer edge of these lock levers 142 inward projections 143 are provided, which can be engaged or detached freely with engaging holes 117 provided on

the both side walls 114 of said casing 110, while controlling portions 145 which engage with concaved slits 144 of said holding down section 141 and project outward are formed at the base part of said lock levers, and these controlling portions 145 are engaged with the engagement slits 119 formed on the both side walls 114 of said casing 110. (refer to the Fig. 1)

[0031] Furthermore, on lower internal surface of a main part 151 of said vertical part 150, an opening filling part 152 which controls agitation of the ink cartridge 1 is protruded, and on the both sides slip-off preventing levers 153 are formed successively, which can moved inward, and at their lower ends stop pawls 154 are formed to be engaged and detached with pawl holes 118 provided on the both side walls 114 of said casing 110. (refer to the Fig. 2)

[0032] 2. How to use

① Insertion of an ink cartridge

To load said ink cartridge 1 into a printer (illustration omitted), face the ink cartridge 1, which is filled or refilled with ink in advance, onto the casing 110, insert the ink cartridge 1 into the hold space 111 in condition that the ink supply port 11 is arranged to the down side, and push the ink cartridge 1 into the hold space 111 using the thick parts 120 and 121 as guides.

[0033] In this event, the engaging projections 12 of the ink cartridge 1 are not faced with the thick parts 120 and 121 and then the ink cartridge can be inserted with no obstacle.

[0034] At the position where said ink cartridge 1 contacts the bottom part 112 of the casing 110, the ink supply port 11 is exposed to the ink supply opening 113 (refer to the Fig. 3)

[0035] Under this condition, face the L shaped lock frame member 130 which stabilizes the ink cartridge 1 onto the ink cartridge 1 and insert its vertical part 150 between the casing 110 and the ink cartridge 1.

[0036] When the above-mentioned inserting operation is finished, the opening filling part 152 gets to press the back side of the ink cartridge 1 and the ink cartridge 1 moves forward by a taper section 152T, then the engaging projections 12 will engage with the narrowed fitting parts 116 provided to the thick parts 121 of the both side walls 114. Furthermore in this event, the slip-off preventing levers 153 of the vertical part 150 engage with the pawl holes 118 and inward projections 143 of the lock levers 142 engage with engaging holes 117, then The L shaped lock frame member 130 will be connected with the casing 110 wherein the ink cartridge 1 is pressed by the hold down section 141

and the opening filling part 152. Therefore the ink cartridge 1 will be arranged and fixed in the casing 110.

[0037] Under this condition, if the adapter 100 is set to a printer, the ink in the ink cartridge 1 is smoothly supplied to the head section from the ink supply port 11, and print operation can be carried out.

[0038] ② Removal of an ink cartridge

Then when ink in the ink cartridge 1 is exhausted, ink refilling has to be carried out.

[0039] In this event, after removing the ink cartridge 1 together with the adapter 100 from a printer beforehand, displace the controlling portions 145 of the lock levers 142 of the L shaped lock frame member 130 inward by finger operation of an operator or the necessary pinching tool (for example, cutting pliers, pliers) to pull out the inward projections 143 of the lock frame members 142 from engaging holes 117, then the inward projections 143 are detached from the casing 110. Therefore, if the L shaped lock member 130 is energized to be drawn out from the casing 110, the stop pawls 154 of the slip-off preventing levers 153 are forced to be detached from the pawl holes 118, and then the L shaped lock frame member 130 can be removed from the casing 110.

[0040] Next, insert fingers into the finger holes 115 and move the ink cartridge 1 backward and detach the engaging projections 12 from the fitting parts 116, then the ink cartridge 1 can be removed through the top opening of the casing 110 by displacing the back side of the ink cartridge 1 upward, therefore maintenance of the ink cartridge 1, like ink refilling, can be performed easily.

[0041] Moreover, in Fig. 5 and Fig. 6, casings 110A and 110B are shown as variations of the embodiment 1, the casing 110A in Fig. 5 is a long sideways type and the casing 110B in Fig. 6 is a tall type. Both of them are prepared in considering the possibility the size of the space where the adapter can be loaded is changed, depending on the size of the ink cartridge 1 and on model or size of the printer to which the ink cartridge 1 is loaded, etc. And the other structure and functions are in common.

[0042] Furthermore, in Fig. 7 as other modification, multicolor type ink cartridges 1C-1E which can be used for color printer etc. and casing 110C-110E for adapters 100C-100E to which the ink cartridges are loaded are arranged adjacently. And the other structure and functions are in common.

[0043] (Embodiment 2)

1. Structure

In Fig. 8 an adapter 100X to which an ink cartridge 1X is held has a casing 100X whose

back side is opened while a through groove 113X for ink supply port 11X is prepared in bottom part 112X, thick parts 120X and 121X are formed in the internal surface of the both side walls 114X, and insertion slits 122X to guide engaging projections 12X of the ink cartridge 1 and split grooves 124X to form stop levers 123X are provided. At the free end of the stop levers 123X, stop projections 126X that have inner outside tapered parts 125X are projected inward.

[0044] 2. How to use

To load the ink cartridge 1 into the adapter 100X, in a direction as shown with an arrow (a) in Fig. 8 insert the ink cartridge 1 into the casing 110X of the adapter 100X, by pushing and spreading out the stop levers 123X. If the ink cartridge is inserted into the casing 110X by engaging the engaging projections 12X with insertion slits 122X, the ink cartridge 1X will be fixed stably in the casing 110X by the stop projections 126X with guide of thick parts 120X and 121X. Then form the ink supply port 11X exposed to the through groove 113X ink can be supplied to a printer smoothly. Furthermore in case of removing the ink cartridge 1X from the casing 110X, just by pulling out the ink cartridge 1 against stop projections 126X in a direction of arrow (b), ink refilling can be performed easily.

[0045] (Embodiment 3)

An ink cartridge 200 shown in Fig. 9 is not different from a conventional ink cartridge in an appearance configuration, however, the present invention provides an ink cartridge 200 having ink capacity altered freely according to intended use by changing capacity of a form chamber 210, and the ink cartridge can be loaded easily without making any changes in size and shape on printer side.

[0046] That is, as shown in Fig. 9, the capacity of a form chamber 210 can be changed freely, by employing a thick bottom part 220 to the bottom of the ink cartridge 200.

[0047] (Embodiment 4)

In an ink cartridge 300 shown in Fig. 10, to cope with the same problem as in said ink cartridge 200, the capacity of a form chamber 310 can be changed, by employing a raised bottom part 320.

[0048] (Embodiment 5)

In an ink cartridge 400 shown in Fig. 11, to cope with the same problem as in said ink cartridge 200 and 300, by loading an air bag 430 on the thin bottom part 420, the capacity of a form chamber 410 provided thereon can be changed.



[0049] In addition, if this air bag 430 is made to store replenishment ink, it can be used for re-filling ink.

[0050] Furthermore, if the number of sheets which can be printed with the ink which each ink cartridge was filled up with is indicated like "printing 100 sheets of A4 size is possible" etc. in a prepared label (illustration omitted), it is convenient practically not only for suppliers but also for users because it can prevent people from mispurchasing and misusing an ink cartridge.

[0051]

#### **Effects of the invention**

According to the said invention, the following remarkable effects can be brought.

[0052] ① An ink cartridge which can supply proper amount of ink to printer neither more nor less according to use purposes can be obtained.

[0053] ② Various kinds of ink cartridges filled with different amount of ink can be stably mounted on printers.

[0054] ③ By using an adapter, one kind of ink cartridge can be applied to various kinds of printers and standardization becomes practicable together with sharp cost reduction while it can prevent an user to be puzzled and to get wrong one in the event of purchase.

[0055] ④ this invention can be applied to an ink cartridge which offers color inks.

[0056] ⑤ Fixed external shape of an ink cartridge, irrespective of the ink capacity, make the handling easy, and sharp cost reduction can be aimed at.

#### **Brief description of the Figures**

Fig. 1 is a perspective view of an ink cartridge in the embodiment 1.

Fig. 2 is a side view of Fig. 1.

Fig. 3 is a M-M sectional view of Fig. 1.

Fig. 4 is an assembly view of Fig. 1.

Fig. 5 is a perspective view showing a variation of a casing in Fig. 1.

Fig. 6 is a perspective view showing another variation of a casing in Fig. 1.

Fig. 7 is a perspective view showing other variation of ink cartridges in Fig. 1.

Fig. 8 is a perspective view of an adapter of an ink cartridge in the embodiment 2.

Fig. 9 is a longitudinal sectional view of an ink cartridge in the embodiment 3.

Fig. 10 is a longitudinal sectional view of an ink cartridge in the embodiment 4.

Fig. 11 is a longitudinal sectional view of an ink cartridge in the embodiment 5.

**Descripti n of Notations**

1, 1C-1E, 1X, 200,300,400	ink cartridge
11, 11X	ink supply port
12, 12X	engaging projection
100,100C-100E, 100X	adapter
110,110A-110E	casing
111	hold space
112,220,320	bottom part
116	fitting part
117	engaging hole
118	pawl hole
130	lock frame member
142	lock lever
143	inward projection
153	slip-off preventing levers
154	stop pawl
122X	insertion slit
123X	stop lever
480	air bag